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# AGRICULTURAL MEMORANDUM No 605

## Rate of change of earth temperature with height for stations in NW England

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Monthly mean earth temperatures were analysed for six stations in northwest England for the period 1963-69. Station heights varied from 91 metres to 556 metres, and the monthly mean earth temperatures over the 7 years were averaged and regressed against these heights.

### Mean monthly 1ft earth temperatures (1963-69)

| Station | Ht above sea level (metres) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grizedale | 91 | 2.8 | 2.9 | 4.1 | 6.8 | 10.4 | 14.3 | 15.3 | 15.2 | 13.8 | 11.1 | 6.8 | 4.0 | 8.96 |
| Newton Rigg | 171 | 2.0 | 2.1 | 3.4 | 6.5 | 10.1 | 14.2 | 15.2 | 15.0 | 13.2 | 10.2 | 6.1 | 3.0 | 8.42 |
| Kielder Castle | 201 | 2.3 | 2.5 | 3.4 | 6.1 | 9.8 | 13.6 | 14.8 | 14.9 | 13.2 | 10.6 | 6.6 | 3.5 | 8.44 |
| Spadeadam | 274 | 1.6 | 1.6 | 2.7 | 5.0 | 8.5 | 12.4 | 13.3 | 13.4 | 11.7 | 9.1 | 5.0 | 2.5 | 7.23 |
| Malham Tarn | 395 | 2.0 | 2.3 | 2.9 | 5.4 | 9.0 | 12.8 | 14.1 | 14.0 | 12.6 | 10.1 | 6.3 | 3.4 | 7.91 |
| Moor House | 556 | 1.3 | 1.3 | 1.6 | 3.4 | 6.9 | 10.2 | 11.4 | 11.6 | 10.9 | 8.0 | 4.5 | 2.3 | 6.12 |

Regressions using all six stations gave an approximately sinusoidal distribution over the year, with the maximum fall in earth temperature with increasing height occurring in June. It was observed that values for the winter months tended to be too high to fit this distribution. The regressions were repeated omitting data for Malham Tarn, and a better fit was obtained. The high winter values were thought to be due to waterlogging of the 1ft earth thermometer at Malham during the winter.

Lapse rates, without Malham data, are given below.

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| °C/100 metres | 0.28 | 0.31 | 0.52 | 0.76 | 0.79 | 0.94 | 0.90 | 0.83 | 0.63 | 0.66 | 0.49 | 0.32 | 0.62 |
| Correlation | -0.87 | -0.87 | -0.98 | -0.98 | -0.98 | -0.98 | -0.97 | -0.97 | -0.93 | -0.95 | -0.89 | -0.82 | -0.97 |

Any comments or suggestions on this paper should be referred to the author.

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